CALIFORNIA RAILROAD COMMISSION

BULLETIN

OF THE

Progress of the Commission's Investigation of Railroad Grade Crossings in the State

APRIL, 1917

Your Co-operation is Earnestly Requested

CALIFORNIA STATE PRINTING OFFICE
SACRAMENTO
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PROGRESS OF THE COMMISSION'S INVESTIGATION OF RAILROAD GRADE CROSSINGS IN CALIFORNIA.

Need of investigation.

Under the Public Utilities Act of California, the Railroad Commission has exclusive jurisdiction over all railroad grade crossings in existence or hereafter constructed. Its power over existing crossings is extensive. It has the exclusive right to alter or abolish any grade crossing. Where practicable, it can require the grades to be separated upon such terms and conditions as it may impose. The lack of state funds to assist in carrying out grade separations, and the uncertainty of the value of other action, deterred the commission for a time from taking any steps, but the increasing number of crossing accidents convinced the commission about a year ago that an effort to better conditions was imperatively necessary.

An examination of the work of other commissions disclosed nothing of material assistance in the problem of grade crossing in California. Nevertheless the matter appeared to be of such importance that after deliberation the commission decided to investigate all grade crossings in the state.

Preliminary steps taken.

As a preliminary step in January, 1916, it published in a pamphlet, its general program for this inquiry. This outlined the crossing problem in California, reviewed the steps the commission could properly take to safeguard crossings, and asked the aid of all in any way able to forward the work. It was sent to every supervisor in the state, to the officials of all cities, towns and railroads; to automobile clubs, and to others who might be interested. In March, 1916, five hearings were held at Sacramento, San Diego, Fresno, Los Angeles and San Francisco. All who received the program were invited to attend and present their own ideas of the best methods to follow in improving safety conditions. The program the commission outlined met an enthusiastic reception. The representatives of the political bodies and the railroads expressed their belief that it would be productive of much good, and indicated a willingness to assist.

Shortly afterwards field work was undertaken, and the whole investigation has now been under way almost a year. It is the purpose of this bulletin to show the methods being used by the commission's engineering department in carrying out its part of the program, the work accomplished and what remains to be done, the effect of the work thus far in reducing crossing accidents, the further action the commission proposes to take, and the help it needs from the public. Comment will be made on other items of interest connected with this subject and it

will, in a measure, supplement the program of a year ago. That program, this bulletin, and the bulletins which will be made subsequently from time to time, will comprise a running record of the commission's investigation of grade crossings in California.

Methods of investigation.

Following the general hearings held in March, transcripts of the testimony and statements were carefully gone over, and a digest was made of suggestions and information received. The crossings specified as particularly dangerous were noted, as were also suggestions for decreasing their menace. Many of the matters discussed in the following pages were touched upon at the general hearings and a large number of the many ideas, subsequently called to the commission's attention, were due to the stimulus given to thought along these lines at that time.

Records for last year show that 58 per cent of those killed at grade crossings and 60 per cent of those injured met with these accidents in Los Angeles County. These startling figures indicated clearly that the first locality which should receive attention was that county. It probably has more railroad mileage than any three other counties in the state, and on account of intensive development the crossings are particularly dangerous.

An assistant engineer was sent to Los Angeles in April, 1916, to devote his entire time to that county until the work should be completed. Except there, the reports indicated that no particular locality had worse than average conditions. Those crossings to which the commission's attention had been called at the general hearings were first investigated.

When these crossings were examined, those adjacent were also considered, so a complete report could be made, in conformity with the original plan that each separate report include only the crossings of one political subdivision—a town, a city or a county. After these crossings, the more populous districts with considerable railroad mileage were investigated, the sequence depending on the ability of the representatives of the railroads and the people to accompany our engineers.

Recommendations by engineers.

The reports to the commission are compiled from notes taken in the field. When the notes in a particular territory have been completed, the engineer of the commission who made them, prepares a report embodying the salient features of the crossings, together with recommendations as to the action needful in the interest of safety, an estimate of the cost, and a fair apportionment of the expense where apportionment appears proper.

The reports are as brief as possible and the information is in statement rather than tabular form, so as to be readable by all interested parties.

For convenience in filing and reference, each report is given a number and each crossing in the report is also numbered. The local name of the crossing is given, if it has one. Each report contains a general statement describing the location of the crossings included therein, the names of the persons who accompanied the Railroad Commission's engineer and other pertinent preliminary information. Then follows a discussion of the facts in connection with each crossing and the recommendation, if any. The report concludes with a recapitulation of the various recommendations made therein, the crossings being referred to by number, and the recommendations listed under the names of the public or railroad officials to whose attention they are called.

When reports containing recommendations have been completed and approved, they are sent to the public authorities and the railroads affected. These are asked to investigate the situation and to inform the Railroad Commission of the action they will take on the recommendations. If accepted without question, the parties are requested to notify the commission when the recommendations have been carried into effect. If not approved, or if objection is made, the recommendation which has been questioned is reconsidered by the engineering department. If it is still of the opinion the work should be carried out as suggested, the matter may be set for a formal hearing by the Railroad Commission on its own motion. At the hearing, evidence is presented by the engineering department and by all interested parties, and the commission makes such formal orders as seem appropriate.

Authorities cooperate.

It was originally the intention to make the crossing reports the joint work of the commission's engineers and the representatives of the public bodies and the railroads, but it has been found impossible to do so. An attempt has been made, however, to secure their active cooperation in making inspections, and it has been successful in almost all cases. It has been necessary in a few instances to make two trips over the crossings. Generally, however, it has been possible to have all the interested parties present and do the work in one trip. In several counties the boards of supervisors have placed an automobile and a representative of the road department at the disposal of the commission's engineers, and the inspection of all the crossings in unincorporated territory in these counties has been made by means of this automobile with the county's representatives. Representatives of the railroads have been present at all of these inspections. In other counties it has been found impracticable to examine the crossings in this way, because the jurisdiction of the railroads and the supervisors is coincident over such short stretches, and the supervisors, who exercise closer jurisdiction over their roads than they do in the counties where the roads are in charge of a highway

department, have, themselves, been desirous of accompanying the engineers. Here it has been found more convenient to make the inspection from the track.

The commission's engineer has usually been accompanied by a representative of the railroad and has made his reports and sketches from a track motor car. Subsequently the supervisor of each district has accompanied him in an automobile to the crossings and has reviewed his recommendations on the ground. Though to a certain extent a duplication of work, the knowledge of local conditions possessed by the supervisor thus made available, justifies the added expense. In some northern counties of the state the commission has been unable to get representatives of the county to accompany its parties although afforded every opportunity to do so.

In the cities and towns it has not been found so practicable to secure the cooperation of all parties. The number of crossings under the jurisdiction of one set of officials is more limited than in the counties, making it difficult to estimate the time inspections will take. It is consequently not so convenient to make arrangements for representatives of either the railroads or the cities and towns to be present when the inspection is made. Often these inspections are made in the interim between other and more pressing work, and there is not sufficient time to notify the proper officials. In such cases, however, it is usual for the commission's engineer to go over his report with the city engineer or some other town or county official, before it is completed and sent out to those who receive them.

Progress of work.

By the first of 1917, crossing surveys were completed in Ventura County, including its incorporated towns and cities; in the unincorporated territory in Los Angeles County; the incorporated towns and cities on the Salt Lake Railroad and some towns and cities on the Santa Fe and Pacific Electric lines in that county on the Northwestern Pacific, a road where crossing conditions are particularly bad, south of Willits as well as the city of Eureka; and on the Southern Pacific lines in Stanislaus County, except for a few towns and cities.

Marin and Sonoma counties were about completed; the crossings in unincorporated territory and some in incorporated territory on the Southern Pacific and the Western Pacific in Alameda County had been examined, as well as those on the main line of the Southern Pacific in Madera County and all lines of the same road in Merced County. In addition to these a large number of Southern Pacific and Santa Fe crossings in San Joaquin County had been examined and some 25 reports were made upon crossings in different parts of the state investigated in connection with informal complaints, or because some crossings

in the vicinity were referred to at the general hearings as particularly dangerous.

In all there were 2,000 crossings inspected at that date, of which 1,600 were covered by 200 reports sent to interested parties; the town, city or county receiving one copy and the railroad two, so one could be sent to division officials and one retained in the general office. Thirty-five of these reports contained no recommendations; in the remainder 1,100 recommendations were made.

These reports vary, from those which merely tabulate the statistical and physical features and require no recommendations, to those in which a detailed study of the situation is made, with extensive recommendations.

Recommendations governed by cost.

At the start the commission, in the "General Program," said that to make radical changes by ordering the construction of a large number of grade separations would be futile at this time, as neither the railroads nor the political bodies have available the large sums of money required. The aim has been to make the cost of the work as little burdensome as possible and to balance the hazard with the cost of removing it at each crossing; removing it, that is, as far as it is possible to remove the hazard of a grade crossing without either abolishing the crossing entirely or separating the grades.

The following list, of the number and kind of recommendations made, shows what has been done:

Install human flagmen	4
Install automatic flagmen or bells	66
Install gates	4
Place, remove or change position of signs	449
Cut brush or trees or trim trees	319
Remove buildings, billboards and other obstructions	30
Grade approaches	27
Change alignment of road	4
Grade between rails	14
Change grade of track	1
Close crossings	92
Separate grades	18
Change location of crossing	1
Change to private crossing	7
Operate trains over at slow speed	2
Other minor recommendations	62
Total	1,100

In addition to these recommendations, 25 have been made for future consideration. Nine of these are for closing streets, ten for separating grades, one for changing the grade of a track, and the balance for various minor changes. About 10 per cent of the improvements ordered have

been carried out and assurance given that 70 per cent of the remainder, which have passed the stage of official consideration, will be looked after as soon as possible.

Among the recommendations several require the railroad company to install signs where watchmen are employed, stating the hours during which the watchmen are on duty, unless they are employed 24 hours per day. This sign, as far as known, has never been used before except on the Long Island Railroad in New York, but it is a cheap safety device and one which the commission may seek to use often in the future.

Closing of streets.

The most important recommendations are those for the elimination of grade crossings by closing streets or by changing the grades to make overhead or underneath crossings. These, of course, are the hardest to carry out. Of the 92 crossings recommended to be closed, several can not be closed until after the construction of adjacent roads, while others are contingent upon the relocation of a main artery of travel. Many of them, however, can be closed immediately by the supervisors, in the counties, and the officials, in the cities, if they will take the necessary steps. While the commission realizes that no crossing can be closed without causing some inconvenience, it believes that the larger good of the communities is more important than individual inconveniences.

No action has been taken in separating grades in the 27 instances recommended. In a few the county or city has plans looking to the elimination of these grade crossings, but they are without funds to do the work at the present time.

Results obtained to date.

The following table shows the results of grade crossing accidents in California from June 30, 1914, to December 31, 1916:

	Killed	Injured	Totals	Per month		
				Killed	Injured	Totals
June 30, 1914, to June 30, 1915	65	314	379	5.42	26.16	31.58
July 1, 1915, to June 30, 1916	108	416	524	9.00	34.66	43.66
July 1, 1916, to Dec. 31, 1916	56	166	222	9.33	27.66	37.00
Totals—30 months	229	896	1,125	7.63	29.87	37.50

The increase of 38 per cent in the number killed and injured during the year ending June 30, 1916, over the previous year, points the need of such work as that now being carried on. A decrease of only 15 per cent during the last six months is not particularly encouraging. The last six months of the year are generally more productive of accidents

than the first six months. The following table makes a slightly better showing when this is considered:

	1915			1916		
	Killed	Injured	Totals	Killed	Injured	Totals
July	11	71	82	10	27	37
August	11	19	30	16	21	37
September	14	59	73	8	26	34
October	8	32	40	12	53	64
November	9	21	30	5	27	33
December	8	32	40	5	12	17
Totals	61	234	295	56	166	222

This indicates a decrease of 25 per cent in accidents for 1916 as against the same period for last year. A decrease of 73 killed and injured for six months, or over 12 a month during the worst months of the year, would be sufficient justification for the crossing investigation if there were any assurance that this reduction was almost entirely due to that, but so many factors enter into the matter and the period covered is so short, that the difference in the figures is too slight to reach any such conclusion.

Traffic increasing yearly.

On the whole the tables do not indicate any satisfactory improvement in the grade crossing situation. The work, however, will result in a saving of many lives. With the highway traffic and the mileage of good roads increasing enormously, with a large amount of traffic formerly carried on passenger trains now being carried on the highways by jitneys and auto stages without any lessening in the number of trains, it can not be expected that accidents in the future will be fewer than in preceding years.

But when the number of persons and vehicles crossing railroad tracks is considered, it will be shown plainly that the investigation and recommendations of the Railroad Commission have resulted in lessening the danger of injury to life and limb. This, of course, is the final test.

The Railroad Commission works on the theory that every crossing should be made as open to the view and as free from obstruction as possible, so those drivers of vehicles who exercise reasonable care shall have ample opportunity to know they are approaching a railroad crossing and to see approaching trains. Most of its recommendations have been made with this in view, as the table previously given indicates. But it has not lost sight of the fact that grade separations must eventually take place at most crossings. Whenever it is possible for a

separation to be made, it is so stated in the reports of the commission's engineers, even though there be no hope of securing it then, and no recommendation is made to cover it.

Future results.

If crossings open and free from obstruction make for safety—as they do—the results of this inspection will be felt for many years in the future—long after its immediate results have been forgotten. The investigation showed that two of the oil companies in the state with large plants in many localities, almost all of them on railroad tracks, had adopted a standard type of picket or board fence which formed an absolute obstruction to the view. The attention of the companies was called to this and both expressed their willingness to remove these fences wherever it was possible. One of them changed its type of fence from solid boards to one of open wire. Many of the letters the Railroad Commission has received from cities, towns and counties have stated that obstructions have been removed in accordance with the commission's recommendations, and that their officials have been instructed to erect no obstructions in the future. Since the work was begun, roadmasters and section foremen on the railroads have been ordered by their general officers to cut brush, trees and other obstructions, and to prevent these growths in the future. Sections on some of the railroads show this work has been done in advance of the commission's surveys.

It was discovered that when the railroads leased portions of their right of way for agricultural purposes, corn was often planted in close proximity to crossings. The attention of the larger railroads was called to this practice and a recommendation made that no corn or other high-growing crop be planted within 300 feet of a crossing. All the railroads receiving these letters immediately wrote the Railroad Commission their approval of this, and said they would incorporate such provisions in future leases. The Santa Fe Company said that this would be done over its entire coast system.

Civic bodies interested.

Improvement clubs, city planning commissions and civic organizations of various other kinds are watching the reports of the commission's engineers with great interest. As they outline crossing improvements which should be made, there is no question that these will be given very serious consideration when the time comes for action.

The investigation of its grade crossings has put California in the front rank of those states taking their grade crossing problems seriously. Requests for the "Grade Crossing Program" come to the California Railroad Commission from state commissions and libraries all over the United States, which ask for specific information concerning its method

of handling certain features of the work. The chairman of the Grade Crossing Committee of the American Railway Association has publicly credited California as a pioneer in the movement for safeguarding crossings. Since the general hearings were held in this state, Colorado, Washington and Oregon have all had similar meetings. Washington has entered upon a program substantially the same as that now being followed by California, and it appears probable that Oregon will do so also in the near future.

Protective devices examined.

Among crossing protective devices the automatic flagman appears the most efficient. Sixty-six of these have been recommended to replace the ordinary crossing signs and bells. The publicity given to the grade crossing subject by the commission in its general hearings, and subsequently, has set many brains at work to devise more efficient protective devices than those which are now available. Hardly a week goes by without some new device being submitted to the California commission for examination. Many of these are without merit, while others seem to hold possibilities worth while testing. The attention of the railroad companies is called to these devices and cooperation secured in fair trials for them.

The proper location of these protective devices is of great importance. It is generally considered best to locate them in the middle of the highway whenever possible to do so; and with the aid of one of the railroads, an automatic flagman has been located in the center of a city street. It is the first installation of its kind in the United States, as far as known. If automobile traffic alone were considered, the proper location of a warning sign would without question be in the center of the improved highways; but the lights used on vehicles drawn by horses are not adequate to indicate the presence of these devices in the road, and there is always the possibility of a serious collision between such vehicles and the signs unless they are lighted at night. It is, therefore, necessary to proceed along these lines with caution. Where electric power is readily available, and other conditions are right, protective signals should be located where they will be most conspicuous, and that is, of course, in the very center of the road.

Standard sign adopted.

On June 28 of this year, the committees of the National Association of Railway Commissioners and the American Railway Association, which are charged with the duty of reporting on grade crossing conditions, held a joint meeting in Chicago. They recommended that every grade crossing should be protected by an approach warning sign placed in the highway at a distance not less than 300 feet on each side of the

railroad tracks, the sign to be a circular disc not less than 24 inches in diameter, painted white, with a black border and black cross lines, with the letters "R. R". Where deemed necessary this approach warning sign is to be properly lighted at night. This recommendation is one which should be followed. A large number of the signs that have been recommended (shown in the table on page 7), have been approach warning signs. Upon the adoption of a standard sign by these associations, a plan was made in accordance with the approved design and copies sent to all interested. Since that time the California commission's reports specifically recommend the use of the sign approved by the two eminent associations.

It occurred to the California commission that if the cities, towns and counties could procure these signs at a fixed and reasonable price, they would be much more willing to follow recommendations than if it were necessary for them to secure bids for their manufacture. The California commission wrote to the larger railroad companies in the state and asked them if they would be willing to manufacture them and sell them to the towns, cities and counties at cost. They have, without exception, been willing to do this, and the price they have made is less than that charged elsewhere for small quantities. In the case of a few counties where a large number of signs will be required, they can be secured cheaper from outside sources than from the railroad companies. On page 16 of this bulletin will be found a plan of the approach warning sign which has just been considered.

Protection by obstacles.

At the general hearings held by the California Railroad Commission last March, a method of protecting grade crossings by compelling slow speed on account of physical obstructions placed in the way of vehicles, was much discussed. Several different plans of this sort were suggested. Six of the best of them, revised to a certain extent, were sent to the railroads, the larger cities and the counties having considerable mileage of good roads. Accompanying the plans was a letter inviting criticisms and suggestions, and asking for experimental installations to be made whenever, in the opinion of the officials, any of the plans could be followed to advantage. Many instructive criticisms from railroads and cities and counties have been received, with assurances that the devices would be given a trial. Los Angeles county especially asserted its intention to test them. Copies of these six designs are attached to this bulletin on pages 17 to 21. Those on pages 18 and 19 seem to meet with almost universal approval. The plan on page 18 forms an obstacle in the roadway so very slight that it can hardly be called an obstruction to traffic; its principal advantage is in the fact that it locates the warning signal in the position in which it can best be seen. The third of the

plans is actually used in the city of Memphis, and the city engineer of that city reports that the installation of the device has resulted in a diminution of the number of grade-crossing accidents in that city.

O'Shaughnessy's device.

All of these plans, of course, are not suitable for all locations. Some will be satisfactory in some situations while entirely out of place in others. The plan on page 20 would not do at all on an important highway, while it might be very efficient on an unimportant county road. The last one on page 21 could be used only in special cases where the tracks were laid at the same time the streets were constructed.

Probably the best type of safety crossing so far designed is a combination of the devices on pages 18 and 19, which was suggested by City Engineer O'Shaughnessy, of San Francisco. On his plan the profile of the road is slightly broken about 400 feet from the crossing and on both sides of it; 25 feet beyond this break, toward the crossing, an approach warning sign is located on the right-hand side of the road, looking toward the track; about 50 feet from the crossing the flagman device and the crossing sign shown on page 18 are placed in the center of the road and the road is widened to provide for the guard fence which surrounds them; immediately beyond the fence is an accentuated break in the road profile as shown in the plan on page 19. It would be difficult to safeguard a grade crossing by mechanical means in a better way than this.

Separation the ultimate goal.

The grade crossing accident reports and investigations continue to bear out the belief that most of the accidents on grade crossings are caused by carelessness. Such accidents as these will not be eliminated by the installation of signs, and only a certain percentage of them will be done away with by safety crossings, as the reckless driver may devote his energy to passing a barrier or protective device at top speed and thus pay less attention to approaching trains than he would without such protection.

The only way to eliminate this class of accidents is to eliminate the crossings. Owing to the great cost of this work there is small immediate prospect of grade separations being made to any large extent, but it should be remembered that *grade separations afford the only absolute solution of the crossing problem, and that anything else is an expedient more or less temporary.*

There are approximately 10,000 grade crossings in the state. One-fifth of them have been examined. This figure includes very many crossings of interurban electric lines located in the cities and occupying

city streets where it is possible to make only very general recommendations and where the work can proceed rapidly. In addition, many others are spur track crossings over which slow and infrequent service is given, and which it is probably unnecessary to investigate. The crossings to be examined in the future will be in the districts where the traffic is lighter and where crossing conditions are not as acute as at those now being examined. The survey will be completed in about one year, except for possibly a few crossings on some of the outlying railroads where traffic is light both by rail and by road.

Commission will pass on recommendations.

When the field work is done, the complete program will by no means have been completed. It will be necessary for the engineering department to follow up the recommendations it has made for a number of years, especially those looking to the separating grades, closing streets and relocating crossings, as a great many of these are made contingent upon the completion of certain work by the municipal and county authorities contemplated but not undertaken. In the meanwhile there will no doubt be many cases in which the commission will be called upon to pass on recommendations its engineering department has made when they are not voluntarily adopted by those to whom they are directed. This will be especially true in connection with closing crossings. The commission's engineers have recognized that they would be unable to secure the closing of crossings without considerable opposition and have been very careful to make these recommendations only when they have been thoroughly convinced that the streets affected should be closed.

Discussions aid solution.

This seems to be a good place to point out that the commission, in considering the reports of its engineering department, in these matters as well as in those pertaining to valuations, takes the attitude that they are in exactly the same category as those made by outside parties. It follows, therefore, that when the commission holds a hearing, on the question of closing a street, for instance, it does not necessarily mean that it is done for the sole purpose of making a record on which to base official action. The hearings will be held, as has been elsewhere said, only in those cases where the recommendations of its engineering department are not voluntarily carried out. Their purpose will be to learn the reasons which have led to the recommendations and the grounds on which they are opposed by those who do oppose them. The decision will be based on all the facts bearing on that particular matter.

The commission feels that even if it does not, after a hearing, approve the recommendations of its engineering department, the hearings themselves will promote discussion of the crossing situation and will

eventually be productive of much good, especially since in many instances it may be possible to readjust matters so the closing of a street, for example, will be a plain question of offsetting a public good against the convenience of a few members of the community.

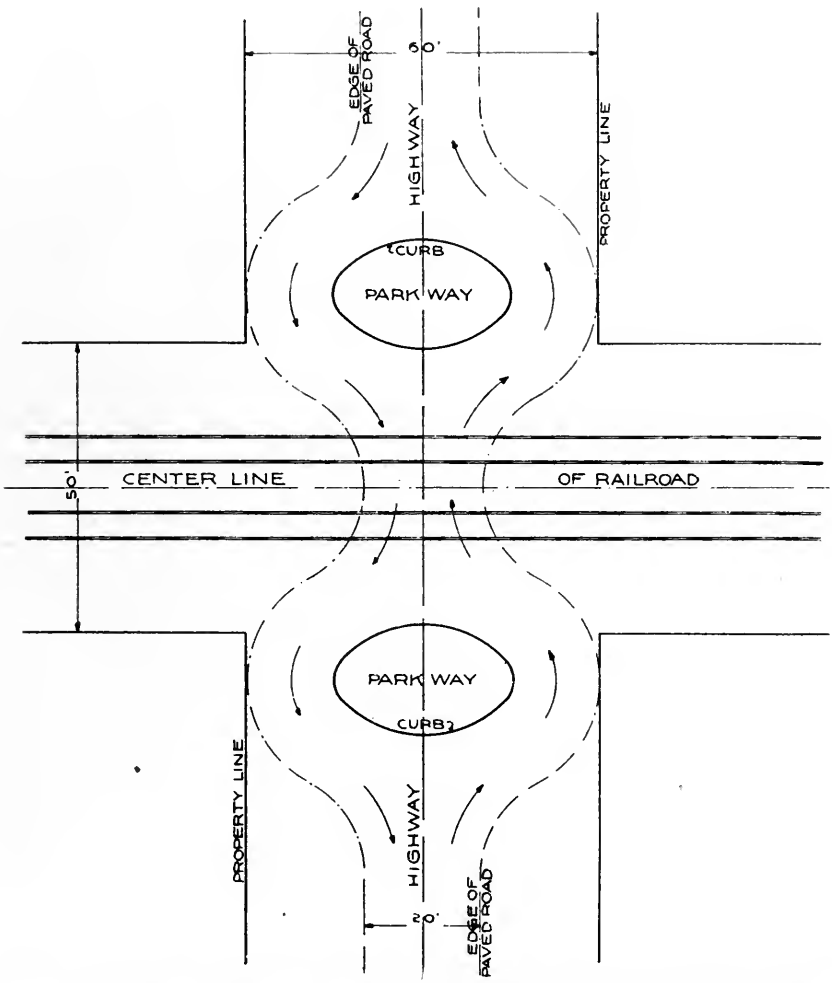
Conclusion.

The commission has been very much gratified by the hearty cooperation it has received from the railroads and from the representatives of cities, towns and counties. The railroad companies have questioned only a few of the several hundred recommendations thus far made to them. Except in the matter of closing streets, the public authorities have shown a like disposition to assist the commission in every way. If this spirit of cooperation continues, the state may look forward confidently to the ultimate successful consummation of the plans for greater safety at railroad crossings now and hereafter to be formulated by the Railroad Commission of California.

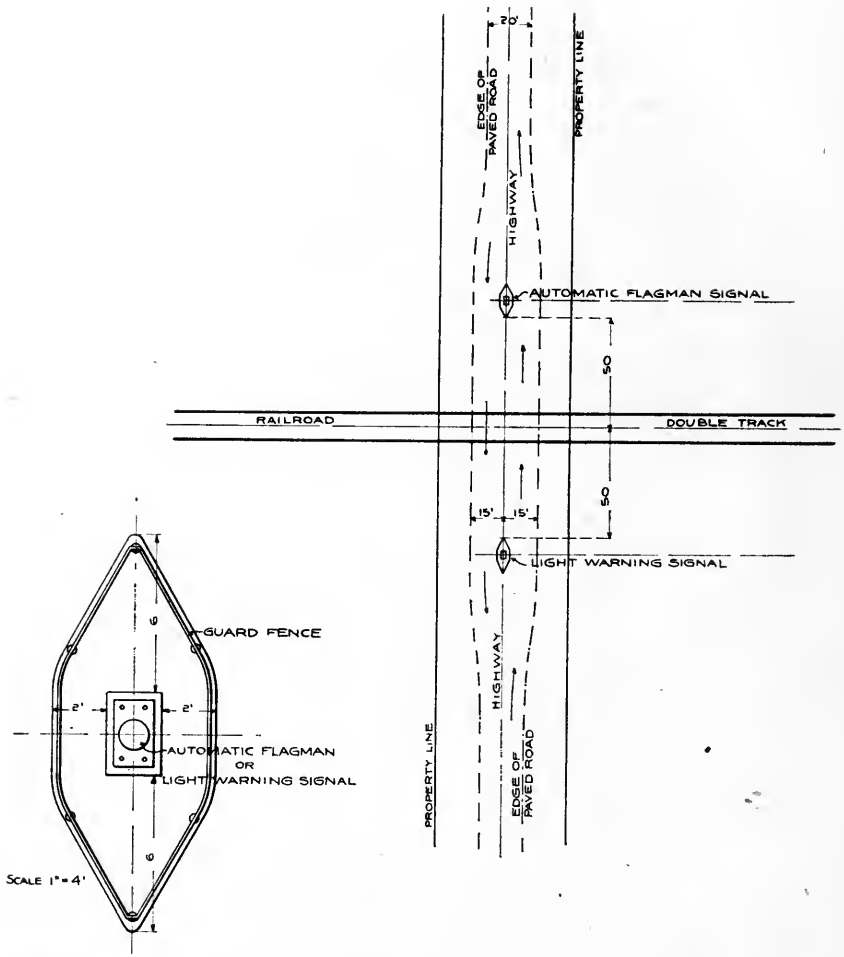
CALIFORNIA RAILROAD COMMISSION.

San Francisco, April, 1917.

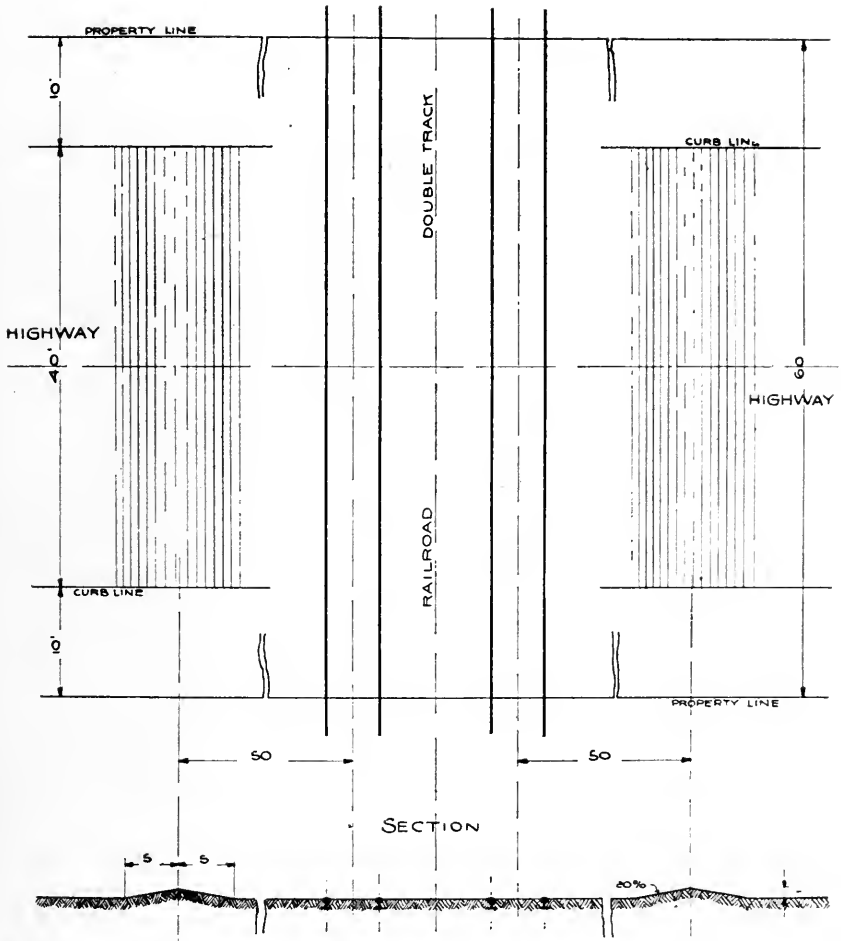
Standard advance warning sign of railroad grade crossings, as adopted by National Association Railroad Commissioners, American Railway Association and California Railroad Commission.



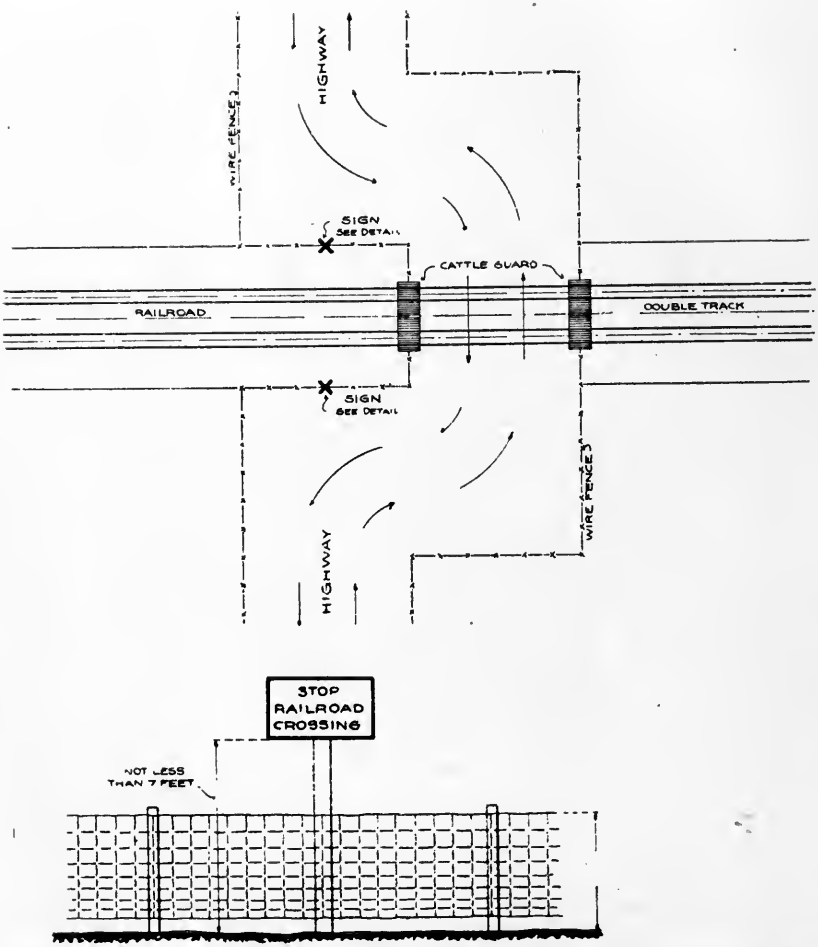
Design of safty grade crossing, based on sketch submitted by F. E. Peters, through the Chamber of Commerce, Tropico, Cal.



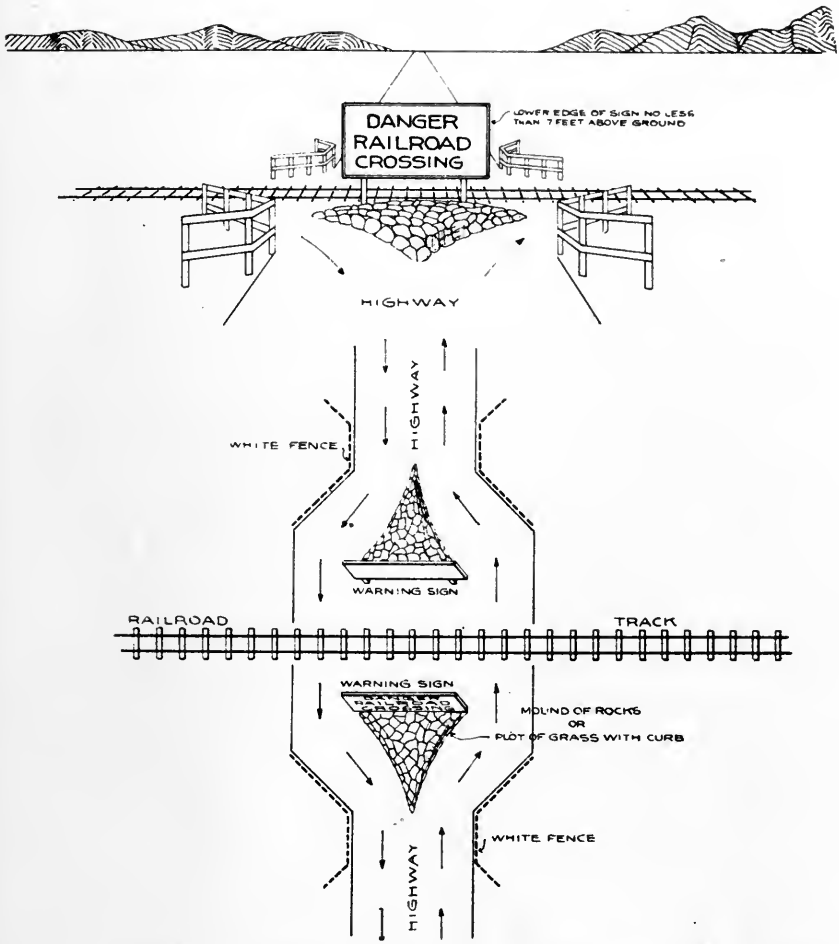
Design of safety grade crossing, based on sketch submitted by Southern Pacific Company Division Engineers Office, Coast Division.



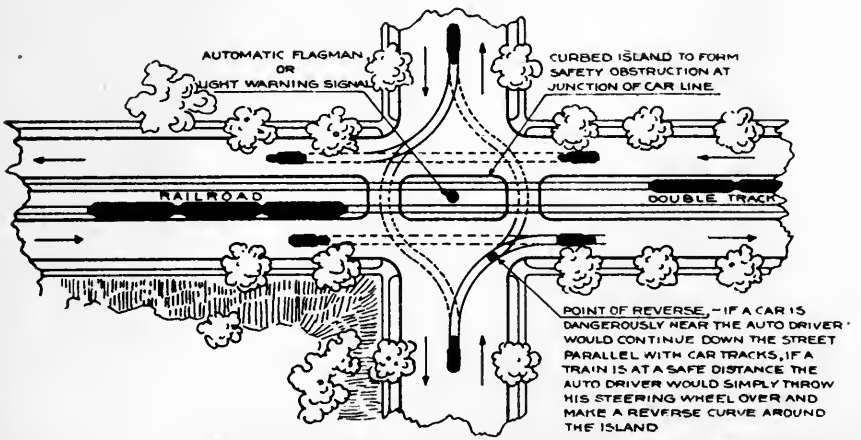
Safety device to retard automobiles at railroad crossings, as executed by J. H. Weatherford, City Engineer, Memphis, Tennessee.



Safety road crossings over railroad, based on sketch submitted by Dr. Chas. R. Blake, Commissioner of Health, Richmond, Cal.



Design of safety grade crossing, based on sketch submitted by Scott W. Alexander, Long Beach, Cal.



Design of Safety grade crossing, based on sketch submitted by William M. Humans, Landscape Engineer, Los Angeles, Cal.